CLAIMS

We claim

1. A method comprising:

accepting an ideal path loss model applicable to an area of interest;

calibrating the ideal path loss model using measurements received from wireless stations of a first set of wireless stations, the measurements measuring the received signal strengths at each respective wireless station of a first set of wireless stations of a wireless network, the stations receiving signals as a result of transmissions by respective wireless stations of a second set of wireless stations of the wireless network, each respective transmission at a known respective transmit power, the locations of each station of the first and second set being known, the calibrating being to determine a calibrated path loss model between the receiving and transmitting wireless stations;

Receiving measurements from a particular wireless station of unknown location, the measurements measuring the received signal strengths at the particular wireless station resulting from respective transmissions from at least some of the stations of the second set of wireless stations, said each of the respective transmissions being at a known corresponding transmit power; and

determining the likely location or locations of the particular wireless station using the received measurements of the received signal strengths at the particular wireless station and the calibrated path loss model.

2. A method as recited in claim 1, wherein the first set and the second set of stations are the same set of managed access points of a managed wireless network such that the calibration of the ideal path loss model is by measuring the path loss between each of the set of managed access points and such that the calibrated path loss model provides a calibrated path loss at each location of the area of interest between each transmitting managed AP and each receiving managed AP.

3. A method as recited in claim 2, wherein the wireless network substantially conforms to the IEEE 802.11 standard.

4. A method as recited in claim 2, wherein the determining of the likely location or locations includes

determining a set of likelihood components for each of a set of locations, each component corresponding to a respective managed access point whose transmissions are listened for at the particular station, and

determining an overall likelihood for each of the set of locations as the product of the likelihood components.

5. A method as recited in claim 4, wherein the determining of the likely location or locations includes, for each managed access point whose transmitted signal is detected at the particular station, determining an inclusive likelihood component as a function of location using the measured path loss and calibrated path loss for the transmission from the respective managed access point to the particular wireless station, such that each inclusive likelihood component provides an indication of the likelihood at any location that the transmission from the access point whose transmission is detected could have been received at the location with the measured path loss.

6. A method as recited in claim 5, wherein the determining of the likely location or locations includes, for each managed access point whose transmitted signal is not detected at the particular station, determining an exclusive likelihood component as a function of location, such that each exclusive likelihood component provides an indication of the likelihood at any location that the transmission from the access point whose transmission is not detected could have been received at the location with an assumed signal strength for the transmitted power.

7. A method as recited in claim 4, further comprising:

displaying the overall likelihood to the user on a user interface showing the area of interest.

8. A method as recited in claim 1, wherein the calibrating includes comparing the ideal path loss to the measured path loss for the known locations of the transmitting and receiving stations to provide a sparse set of adjustment factors between a sparse set of known locations.

9. A method as recited in claim 8, wherein the adjustment factor between a known location and an unknown location is determined as a weighted sum of path losses between the known location and a sparse set of other known locations.

10. A method comprising:

accepting an ideal path loss model applicable to an area of interest;

calibrating the ideal path loss model using measurements received from each respective wireless station of a first set of wireless stations of a wireless network measuring the received signal strengths at each of the respective wireless stations, the stations receiving signals as a result of transmissions by respective wireless stations of a second set of wireless stations of the wireless network, each respective transmission at a known respective transmit power, the locations of each station of the first and second set being known or determined, the calibrating being to determine a calibrated path loss model between the receiving and transmitting wireless stations;

receiving measurements from each respective station of a third set of wireless stations of the wireless network measuring the received signal strength at each of the respective stations resulting from transmission of a signal from a potential rogue access point, each station of the third set being at a known or determined location; and

for each of a set of assumed transmit powers for the potential rogue access point, determining the likely location or locations of the potential rogue access point using the received signal strengths at the stations of the third set and the calibrated path loss model.

11. A method as recited in claim 10, wherein the first set and the second set of stations include the same set of managed access points of a managed wireless network such that the calibration of the ideal path loss model includes the measuring the path loss between each of the set of managed access points and such that the calibrated path loss model provides a calibrated path loss at each location of the area of interest between each transmitting managed AP and each receiving managed AP.

12. A method as recited in claim 11, wherein the third set of wireless stations include managed access points of the set of access points of the wireless network.

13. A method as recited in claim 11, wherein third set of wireless stations include wireless clients of at least one managed access point of the wireless network, the location of each client being determined by a radiolocation method including:

measuring the received signal strengths at the wireless client resulting from respective transmissions from at least some of the managed access points, said each of the respective transmissions being at a known corresponding transmit power; and

determining the likely location of the wireless client using the received signal strengths and the calibrated path loss model.

14. A method as recited in claim 11, wherein the wireless network substantially conforms to the IEEE 802.11 standard.

15. A method as recited in claim 11, wherein the determining of the likely location or locations includes:

determining a set of likelihood components for each of a set of locations, each component corresponding to a respective managed access point whose transmissions are listened for at the particular station, and

determining an overall likelihood for each of the set of locations as the product of the likelihood components.

16. A method as recited in claim 15, wherein the determining of the likely location or locations includes, for each managed access point whose transmitted signal is detected at the particular station, determining an inclusive likelihood component as a function of location using the measured path loss and calibrated path loss for the transmission from the respective managed access point to the particular wireless station, such that each inclusive likelihood component provides an indication of the likelihood at any location that the transmission from the access point whose transmission is detected could have been received at the location with the measured path loss.

17. A method as recited in claim 16, wherein the determining of the likely location or locations includes, for each managed access point whose transmitted signal is not detected at the particular station, determining an exclusive likelihood component as a function of location, such that each exclusive likelihood component provides an indication of the likelihood at any location that the transmission from the access point whose transmission is not detected could have been received at the location with an assumed signal strength for the assumed transmitted power.

18. A method as recited in claim 15, further comprising:

displaying the overall likelihood to the user on a user interface showing the area of interest.

19. A method as recited in claim 10, wherein the calibrating includes comparing the ideal path loss to the measured path loss for the known locations of the transmitting and receiving stations to provide a sparse set of adjustment factors between a sparse set of known locations.

20. A method as recited in claim 19, wherein the adjustment factor between a known location and an unknown location is determined as a weighted sum of path losses between the known location and a sparse set of other known locations.

21. A carrier medium carrying one or more code segments to instruct one or more processors of a processing system to execute a method comprising:

accepting an ideal path loss model applicable to an area of interest;

calibrating the ideal path loss model using measurements received from each respective wireless station of a first set of wireless stations of a wireless network measuring the received signal strengths at each of the respective wireless stations of the first set, the stations receiving signals as a result of transmissions by respective wireless stations of a second set of wireless stations of the wireless network, each respective transmission at a known respective transmit power, the locations of each station of the first and second set being known, the calibrating being to determine a calibrated path loss model between the receiving and transmitting wireless stations;

receiving measurements from a particular wireless station of unknown location measuring the received signal strengths at the particular wireless station resulting from respective transmissions from at least some of the stations of the second set of wireless stations, said each of the respective transmissions being at a known corresponding transmit power; and

determining the likely location or locations of the particular wireless station using the received signal strengths at the particular wireless station and the calibrated path loss model.

22. An apparatus comprising:

a processing system including a memory and a network interface to couple the apparatus to a network including a set of managed access points of a wireless network, the processing system to:

accept an ideal path loss model applicable to an area of interest;

instruct each of the managed access points at known locations in the area of interest to measure and report the received signal strengths as a result of transmissions by respective other managed access points of the set, each respective transmission at a known respective transmit power, the locations of each managed access point in the area of interest being known

receive the reports of the measurements from the instructed access points;

calibrate the ideal path loss model to determine a calibrated path loss model between the receiving and transmitting wireless stations;

receive from a particular wireless station of unknown location the received signal strengths resulting from respective transmissions from at least some of the managed access points in the area of interest, said each of the respective transmissions being at a known corresponding transmit power; and

determine the likely location or locations of the particular wireless station using the received signal strengths at the particular wireless station and the calibrated path loss model.

23. A method comprising:

accepting an ideal path loss model;

calibrating the ideal path loss model in an area of interest using path loss determined from measurements between access points of a wireless network, the access points at known locations, the measurements received from some of the access points measuring their received signal strengths resulting from respective transmissions from respective access points, each respective transmission at a known respective transmit power, the calibrating being to determine a calibrated path loss model between the access points;

determining the measured path loss between a wireless station of unknown location and at least some of the access points by receiving measurements from the wireless station, wherein in the case the wireless station of unknown location is a client station of one of the access points, the determining uses measurements received from the wireless station of unknown location measuring the received signal strength as a result of respective transmissions from at least some of the access points, said each respective transmissions being at a known respective transmit power, and wherein, in the case the wireless station of unknown location is an potential rogue access point, the determining uses measurements received from each of at least some of the access points measuring the received signal

strength at each of the access points resulting from transmission of a signal from the potential rogue access point for each of a set of assumed transmit powers for the potential rogue access point; and

determining the likely location or locations of the wireless station of unknown location using the measured path loss and the calibrated path loss model.